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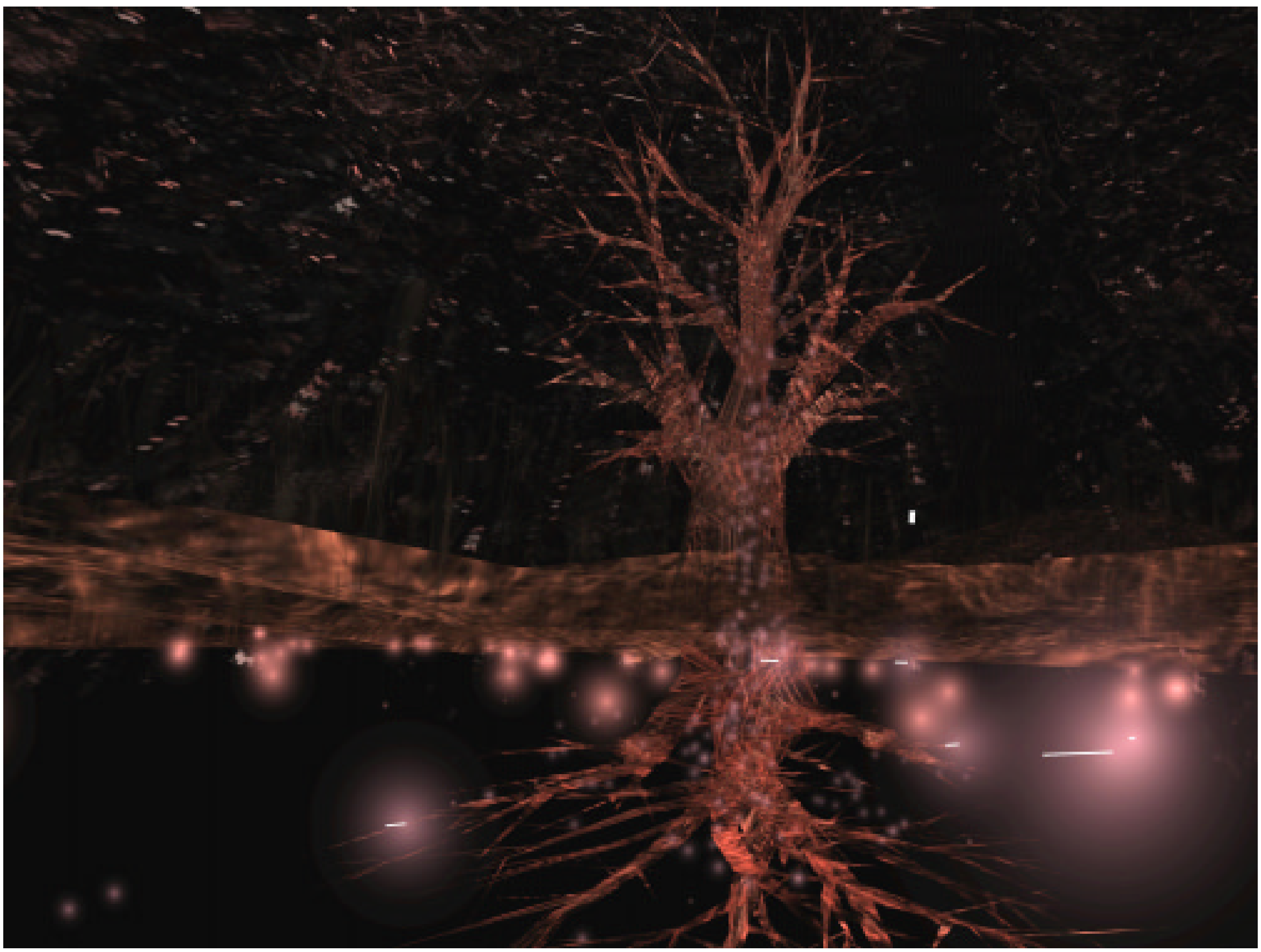
ARTIFICIAL LIFE: CREATURES AND ENVIRONMENTS



formerly YLEM newsletter

A-LIFE: CREATURES AND ENVIRONMENTS

--Loren Means
www.clannails.org/loren

In his article "On Some Motifs in Baudelaire" (reprinted in Illuminations, p. 188), Walter Benjamin made this statement which haunts me: "To perceive the aura of an object we look at means to invest it with the ability to look at us in return." Whatever Benjamin's intent in this statement, I take it quite literally. I look forward to an art which will look at me, talk to me, and dance with me.

Discussions of art created using Artificial Life approaches have tended over the years to focus on the methods by which the art was created. The art of the three principal pioneers of A-Life art—William Latham, Thomas Ray, and Karl Sims, has motivated lengthy expositions on the parallels between the methodologies of these artists and our increasing understanding of evolutionary processes. It is only recently that it has been fruitful to concentrate on A-Life art from the standpoint of aesthetics. In the work of Latham, Ray, and Sims, the conceptual tends to outweigh the aesthetic, whereas in the more recent work of Steven Rooke (www.azstarnet.com/~srooke) and Guenter Bachelier, the work stands on its own aesthetic merits, irrespective of the methods of its creation.

This contemporary art rivals the work of human artists in complexity, invention, and especially in abundance, and is possibly the most exciting art being produced today. The YLEM Journal and its predecessor the YLEM Newsletter have covered A-Life art consistently over its 20-year life span, and will continue to do so as one of its main ongoing projects. It is projected that at least one A-Life issue will be produced each year, as YLEM will continue to spotlight the work of artists on the leading edge of science and technology.

In thinking about and participating in A-Life art production, several dichotomies present themselves to me on a recurrent basis, and I'd like to touch on a few of them. I'm not postulating a struggle between the elements of these dichotomies, rather I think of them as examples of "twisted pairs".

One of these dichotomies is between artificial creatures and artificial environments. This difference is usually glossed over in discussing A-Life art, but I see it as a fundamental concept. A creature is bounded, has outlines, and can be perceived as potentially capable of locomotion, or at least of the capacity to be moved around—as separate from its background and standing apart from it. Early A-Life experimenters tended to create creatures. It is creatures which are animated by robotics, an emerging art form.

An environment entails the surroundings that may contain creatures, but at least will be inhabited by the perception of the viewer of the art work. An environment can be conceived as boundless, with the edges imposed by the artist thought of as somewhat arbitrary. Like the natural world A-Life art tends toward the boundless. Some artists start out working in an environment with large boundaries and pluck out an area which corresponds to a conventional viewing area for exhibition. For instance, Andrew Haynes grows crystals which he scans with his microscope for areas to which he responds, and these areas he photographs (YLEM Journal Vol. 20 #6). Daniel Shulman-Means creates similarly large-bounded environments in Photoshop, then scrolls with his monitor to an area which he chooses to save and print (http://clannails.org/organics/). And Steve Aubrey reported a similar experience with selecting from large areas in creating his 3-d lenticular pieces. (www.studionotes.org/24/aubrey.html.)

Other artists create environments which can be traversed by the viewer through manipulation of the medium (usually a computer display). Guenter Bachelier's oeuvre, for instance, includes not only panoramic images which can be scrolled across, but also run-time movies which take the viewer on a journey as across the expanses of an alien planet. This work, like the Quick Time Virtual Reality works of Marius Johnston (YLEM Journal Vol. 22 #4/6), constitutes an art form that is a hybrid between painting and film, in that the viewer can control the journey through the environment, stopping, accelerating, and varying the order in which the images are experienced.

While artificial consciousness is more likely to be a goal of the creator of creatures than of landscapes, Stanislaw Lem did conceive of a conscious and creative landscape in his novel of the planet Solaris.

This brings up another dichotomy in A-Life art which I've alluded to in the previous paragraph, the schism between works of art that are static and those that are temporal in nature. Bachelier's static works are presented here, but his temporal works are linear in nature and can be rendered static by pausing them. This is not the case with temporal work which is closer to film, in which the images are not traversed by the viewer but are experienced as the rapid replacement of one image by another, often of radically different character. These temporal works differ from animation in that animation uses similarity from frame to frame to create smooth transitions of imagery. The temporal art that uses dissimilar images replacing each other creates an experience of moving forward into a static frame whose images are exploding into and out of existence. Examples of this are the work of Scott Draves (whose goal is the constant self-creation of images that never repeat themselves) (YLEM Journal Vol. 20 #6) and the IMA Traveller software by Erwin Driessens and Maria Verstaapen. (www.xs4all.nl/~notnot/ima/IMAcat.html).

When I learned non-repetitive film painting from Ron Morrissey in the Sixties, he told me that his images, when

(Continued page 4)

cover illustration: Char Davies, TreePond

Design: Visualizing the Unimaginable
Wednesday, November 20, 7:30 PM
McBean Theater, The Exploratorium
3601 Lyon St., San Francisco, CA 94123
The YLEM Forum is free, open to the public and wheelchair accessible.

Design has been utterly transformed by computers and the interactivity that it allows. Come see what star designers of this new era, France Israel, Andy Kramer and Kevin Walker, have invented that changes how we drink in knowledge.

Architectural Simulations

France Israel of View by View will trace how she and her partner, Mieczyslaw Boryslawski, have provided fantastic 3D walk-through computer models and imagery for architecture, construction and real estate developers in both still and animated form for the last dozen years. The models are interactive, allowing on-the-spot comparisons of design possibilities.

View By View was responsible for and sponsored the very first successful national digital art and architecture exhibit which was co-sponsored by Apple Computer Company Inc., Cannon USA, Kodak and Adobe Inc.

View By View's work is permanently on display at the Old Executive Office Building, The White House, Washington D.C.

Interactive Museum Design
Andrew Kramer shows how the firm he founded, West Office Exhibition Design, folds technology seamlessly into the exhibit experience, linking video, animatronics, special effects and theatrical lighting systems. He will show the master planning they have done for numerous museums, traveling exhibitions, and corporate education centers. His associate, Kevin Walker also designs interactive installations for museums, working with West Office and as an independent artist. His award-winning exhibits at the American Museum of Natural History in New York have immersed visitors in everything from the microscopic world of viruses, to frozen Antarctic journeys, to distant galaxies. He will show some of these, plus recent innovative installations and art projects.

For each project they have invented unique communication techniques, and are investigating the use of the web, allowing the experience to be extended to school or home.

Kevin Walker also designs interactive installations for museums, working with West Office and as an independent artist. His award-winning exhibits at the American Museum of Natural History in New York have immersed visitors in everything from the microscopic world of viruses, to frozen Antarctic journeys, to distant galaxies. He will show some of these, plus recent innovative installations and art projects.

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Complete information listed at http://www.ylem.org/

JOHN J. SCARPA
May 31st 1950 - November 4th 2002

IN REMEMBRANCE

YLEM member John J. Scarpa, founder of Light Alchemy who worked with sculpting light into Lumia forms and developing unique computer and video display systems for 3D projection of light art has entered the realm of pure light. John had recently exhibited in the YLEM 20th anniversary show with an anaglyphic rendering of one of his lumia creations. He is also known for being a special visual effects designer for George Coates Performance Works and had recently participated in other art exhibitions in the Bay Area. He was also associated with the Northern Californian National Stereoscopic Association and was a member of the former Bay Area Multi Image Showcase organization. His final lumia projection was shown in Chicago at Lightology's Rays of Light exhibition.

In honor of his association with YLEM, his family has set up a John J. Scarpa memorial Fund and any donations that wish to be made in John's name to YLEM can be directed to the organization.

We salute John Scarpa for his generosity and creativity in mastering light as a creative art medium and how he illuminated the lives of his friends with his art. John, thank you for the vision.

projected at normal speed, could “really snow the mind.” At that time I conceived of a perceptual consciousness which was projected from the viewer onto the screen to try to grab imagery and hold onto it as the shapes and colors sped by. I have since found myself more comfortable extracting sections of my films, blowing them up, and putting them up on gallery walls for contemplation which can be structured by the viewer. I still think in terms of a perceptual consciousness which is projected from the viewer onto the work of art, and moves around in the environment, structuring the viewing experience. I tend to think of this perceptual consciousness as analogous to a homunculus, or an avatar, a miniaturization of consciousness into an entity capable of free motion outside the body.

According to Karl O’Donaghue, Char Davies sees this concept of a perceptual, projective consciousness in a negative way, stating that “the entire body is propelled by scopic desire.” He suggests that Davies’ environment takes the body itself into virtual reality, instead of the out-of-body experience of projective consciousness.

Another dichotomy in the discussion of Artificial Life art is between abstraction and mimesis. Emphasis in the early manifestations of A-Life art tended to be on abstract or alien environments or creatures. This was probably in part because of the excitement of creating life forms and landscapes that had never existed before, and the surprise of seeing what images the self-organizing aspects of A-Life art would produce. A strong trend in emerging A-Life art and technology these days is toward simulation of real-world entities, toward the creation of artificial humans and animals that ultimately will mimic and then manifest consciousness. Demetri Terzopoulos’ artificial fish are examples of artificial entities which teach themselves to swim, see, feed, and avoid predators. (At this point they aren’t quite able to mate successfully to reproduce other fish.) My hope is that ultimately alien creatures will be allowed to manifest themselves with the consciousness and creativity of actual creatures, but with the potential aesthetic variety of virtual creatures.

Still another dichotomy in A-Life is between contemplative and interactive manifestations. In a contemplative manifestation, the viewer may either observe the art or manipulate it to the extent of starting and stopping the motion of a temporal realization. In interactive works, the viewer participates actively, to the extent of influencing the shape and color of imagery or even of bringing to life and sustaining the life of creatures. YLEM Journal Vol. 21 #8 was devoted to interactive art, and Char Davies’ Osmose is another example of it.

Demetri Terzopoulos is Lucy and Henry Moses Professor of Computer Science and Mathematics at the New York University Media Research Lab. His web page is www.mrl.nyu.edu/~dt. His work is discussed by Peter Coveney and Roger Highfield in Frontiers of Complexity (pp. 262-264) and by Rudy Rucker in YLEM Journal Vol. 21 #10/12.

Karl O’Donaghue is an Irishman who received his MA in Interactive Media from the Dublin Institute of Technology. His interview with Char Davies is available at rhizome.org.

Guenter Bachelier has a PhD in Information Science from the University of Saarland, in Germany. His dissertation was entitled “Polyrepresentation, Relevance-Approximation and Active Learning in the Vectorspace Model of Information Retrieval.” As a painter he was influence by the work of Jackson Pollock and Gerhard Richter. He hopes to obtain funding to produce large-scale versions of his self-generated works.

Artificial Life CInematography

Demetri Terzopoulos
New York University
http://www.cs.toronto.edu/~dt/

Introduction

Computer animation is a fascinating discipline at the intersection of art, science, and technology. It is concerned with the challenge of imparting liveliness to synthetic objects in virtual worlds represented by computer.

Audiences everywhere are delighted by state-of-the-art computer animation effects of the sort featured in the modern classic “Jurassic Park” (Universal Pictures, 1993) or in the recent computer animation milestones “Monsters, Inc.” (Walt Disney Productions/Pixar, 2001) and “Final Fantasy: The Spirits Within” (Square USA, 2001). As with traditional cell animation, it is easy to suspend disbelief and imagine that the graphical characters portrayed on screen are more or less alive. However, these characters are by no means living beings. They certainly have no inherent intelligence. In fact, they are hardly autonomous. Rather, these “graphical puppets” must be laboriously hand animated by highly skilled human animators or programmed to mundanely repeat recorded motions deliberately performed by real-life actors under controlled conditions.

In this article, I present a new breed of self-animating graphical characters that largely circumvent the drudgery of manual character animation. Self-animating characters are a form of leading edge, Artificial Life CG technology [1]. “Artificial Life” is an emerging scientific field that is concerned with the computer modeling of phenomena associated with natural, biological life [2]. Our artificial life research has confronted the scientific challenge of developing realistic artificial animals endowed with functional bodies and brains. This research has yielded simulated physical worlds inhabited by sophisticated autonomous agents in the form of graphical characters that are autonomous, intelligent and, at least in some very rudimentary sense, “alive”.

Artificial Fishes

We have devoted significant effort to creating aquatic artificial animals [3][4]. Imagine a virtual marine world inhabited by a variety of self-animating fishes (Figure 1). In the presence of underwater currents, the fishes employ their muscles and fins to swim gracefully around immobile obstacles and among moving aquatic plants and other fishes. They autonomously explore their dynamic world in search of food. Large, hungry predator fishes stalk smaller prey fishes in the deceptively peaceful habitat. Prey fishes swim around contentedly, until the sight of predators compels them to take evasive action. When a predator shark appears in the distance, similar species of prey form schools to improve their chances of survival. As the predator nears a school, the prey fish scatter in terror. A chase ensues in which the predator selects victims and consumes them until satiated. Some species of fishes are untroubled by predators. They find comfortable niches and feed on floating plankton when hungry. Driven by healthy libidos, they perform intricate courtship rituals to attract mates.

Animation as Artificial Life Cinematography

Our artificial life approach to computer animation has led to the production of two computer-animated short subjects, essentially mini-documentaries about the virtual marine world of artificial fishes, that have been screened internationally before large audiences [5][6]. The creative process underlying these animations has the following distinguishing feature: Rather than being a graphical character puppeteer, the computer animator engages in a creative process analogous to that of an underwater nature cinematographer. The animator strategically immerses and positions one or more virtual cameras within the virtual marine world so as to capture interesting “film footage” of the behaviors of artificial fishes. The footage is edited, assembled, and narrated to produce the final documentary. This creative process is fundamentally similar to that associated with the fascinating genre of marine life documentaries for which the Cousteau Society or the National Geographic Society are famous.

Imagine a virtual marine world inhabited by a variety of self-animating fishes..

In the remainder of the article, I will review the artificial fish models that have made possible our artificial life cinematography approach to computer animation. The comprehensive modeling methodology, in which we model the form, appearance, and basic physics of the animal and its habitat, as well as the animal’s means of locomotion, its perceptual awareness of its world, its behavior, and its ability to learn, has been described in detail elsewhere [3]. Our methodology is generally applicable to the modeling of all sorts of animals, including humans, for use in computer animation.

Functional Modeling of Fish

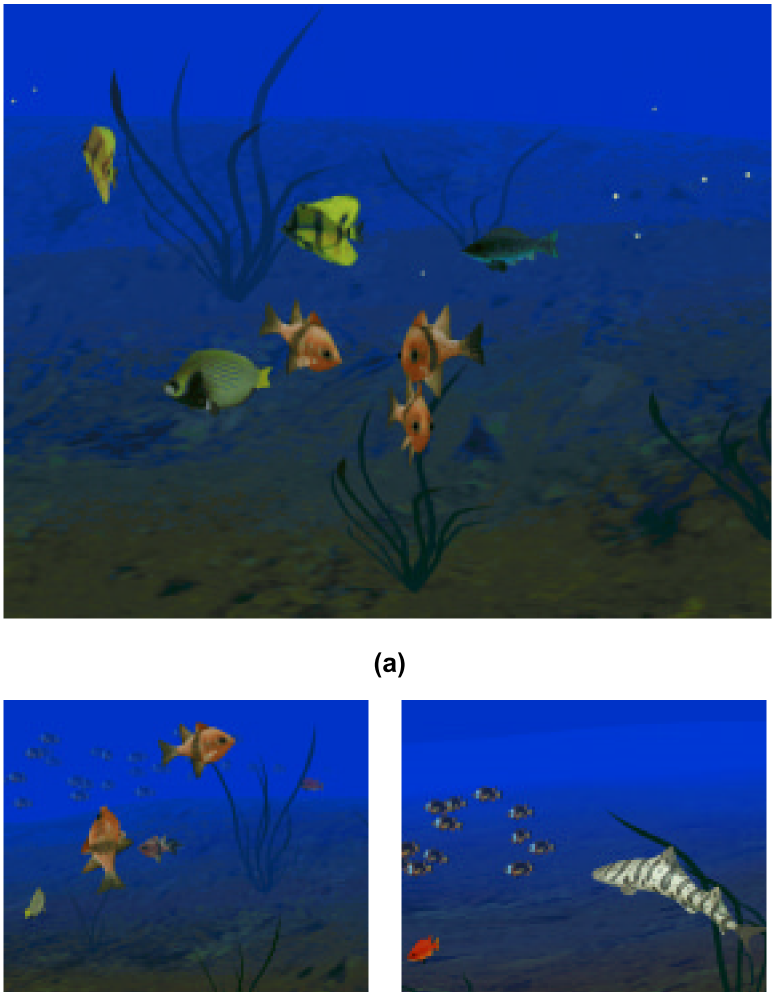
We have developed a functional model of certain species of (teleost) fishes that can automatically animate itself with considerable realism. The artificial fish is an autonomous agent with a realistic deformable body actuated by internal muscles, with eyes, and with a brain that includes motor, perception, behavior, and learning centers. Figure 2 presents a schematic of the functional model and this section reviews its main functional components.

Display Mode

First, we want our artificial fishes to capture the form and appearance of a variety of natural fishes with reasonable visual fidelity. To this end, digitized photographs of real fish, such as the images shown in Figure 4(a), are converted into three-dimensional spline surface body models (Figure 4(b)) with the help of interactive image analysis tools, and the image texture is mapped onto the surfaces to produce the final textured geometric display models of the fishes (Figure 4(c)).

Biomechanical Model and Locomotion

The artificial fish captures not just the 3D form and appearance of real fishes, but also the basic physics of these animals in their environment. The motor system of the artificial fish (Figure 2) comprises a piscine biomechanical model, including muscle actuators and a set of motor controllers. Figure 3(a) illustrates the mechanical body model, which produces realistic piscine locomotion using only 23 lumped masses and 87 elastic elements. These mechanical components, whose dimensions and physical parameters are modified to model different fishes, are interconnected to maintain the structural integrity of the body as it flexes due to the action of its 12 contractile muscles.



(a)

(b) (c)

Figure 1. Artificial fishes in their virtual marine world as it appears to an underwater observer. (a) The three reddish fish are engaged in mating behavior while the other fish are foraging among seaweeds. (b) A school of fish appears in the distance. (c) A predator shark stalking prey.

The artificial fish locomotes like real fishes do, by autonomously contracting its muscles. As the body flexes it displaces virtual fluid, which induces local reaction forces normal to the body. These hydrodynamic forces generate thrust, primarily via the caudal fin, which propels the fish forward (Figure 3(b)). The dynamics of the biomechanical model are governed by a system of coupled second-order ordinary differential equations driven by the hydrodynamic forces. A numerical simulator continually integrates these equations of motion forward through time. The biomechanical model achieves a good compromise between realism and computational efficiency, permitting the real-time simulation of fish locomotion.

The motor controllers (Figure 2) coordinate muscle actions to carry out specific motor functions, such as swimming forward, turning left and right, ascending and descending in the water. They translate natural control parameters such as the forward speed or angle of the turn into detailed muscle actions that execute the function. The artificial fish is neutrally buoyant in the virtual water. Its two pectoral fins enable it to navigate freely in its three dimensional world by pitching, rolling, and yawing its body, as well as to stabilize the body during locomotion. Specialized motor controllers coordinate the pectoral fin actions.

Learning

The learning center of its brain (Figure 2) enables the artificial fish to learn how to locomote through practice and sensory reinforcement. Through optimization, the motor learning algorithms discover muscle controllers that produce efficient locomotion. Muscle contractions that produce forward movements are “remembered”. These partial successes then form the basis for subsequent improvements in swimming technique. Their brain’s learning center also enables the artificial fishes to train themselves to accomplish higher level sensorimotor tasks, such as maneuvering to reach a visible target or learning more complex motor skills (see [7] for the details).

Perception

Artificial fishes are aware of their world through sensory perception. Their perception system relies on a set of onboard virtual sensors to gather sensory information about the dynamic environment. It is necessary to model not only the abilities but also the limitations of animal perception systems in order to achieve natural sensorimotor behaviors. Artificial fishes perceive objects within a limited field view if objects are close enough and not occluded by other opaque objects. The perception center of the artificial fish brain includes a perceptual attention mechanism (indicated by “!” in Figure 2), which enables the artificial fish to sense the world in a task-specific way, hence filtering out sensory information superfluous to its current behavioral needs. For example, while foraging, the artificial fish attends to sensory information about nearby food sources. Reference [8] describes a biomimetic approach to perception.

Behavior

The behavior center of the artificial fish's brain mediates between its perception system and its motor system (see Figure 2). A set of pre-specified, innate characteristics determine whether the fish is male or female, predator or prey, etc. The behavioral repertoire of the artificial fish comprises a set of behavior routines arranged in a loose hierarchy. These include primitive, reflexive behavior routines, such as obstacle avoidance, as well as more sophisticated motivational behavior routines, such as schooling and mating. An action selection mechanism underlies the goal-directed behavior of the artificial fish in its dynamic world. The action selection mechanism controls the perceptual attention mechanism. Action selection takes into account the innate characteristics of the fish, its mental state as represented by hunger, fear, and libido mental variables, and the incoming stream of sensory information, in order to generate dynamic goals for the artificial fish, such as to avoid an obstacle, to hunt and feed on prey, or to court a potential mate. Exploiting a single-item memory, the action selection mechanism ensures that goals have enough persistence to supports sustained behaviors such as foraging, schooling, and mating.

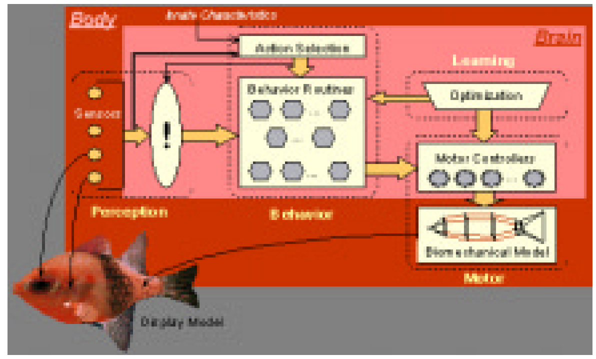


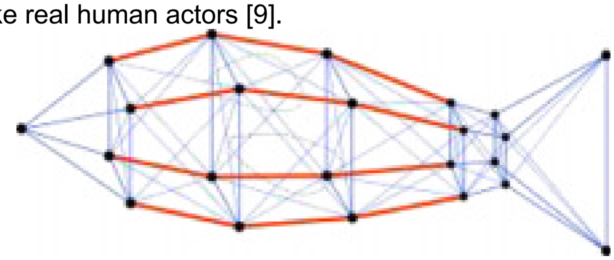
Figure 2. Functional artificial fish model. The piscine body harbors a biomechanical model and a brain with motor, perception, behavior, and learning centers. (The perceptual attention module is marked "!".)

Conclusion

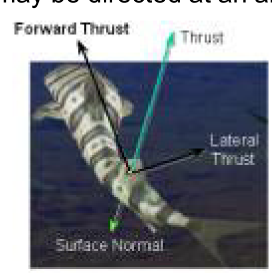
The science of artificial life can contribute profoundly to the art of computer animation. I described a virtual marine world inhabited by artificial life forms that emulate the appearance, motion, and behavior of marine animals in their natural habitats. Each artificial animal is an autonomous agent in a simulated physical world. It has (i) a three-dimensional body with internal muscle actuators and functional fins that deforms and locomotes in accordance with the principles of biomechanics and hydrodynamics, (ii) sensors, including eyes that can perceive the environment, and (iii) a brain with motor, perception, behavior, and learning centers. Artificial fishes exhibit a repertoire of piscine behaviors that rely on their perceptual awareness of their dynamic habitat. Furthermore, they can learn to locomote through practice and sensory reinforcement.

Our novel approach has enabled us to produce realistic computer animation of natural environments in which the animator plays a role akin to that of a nature cinematographer. In our animated productions, the detailed motions of the artificial fishes emulate the complexity and unpredictability of movement of their natural counterparts, which enhances the visual beauty of the animations.

Our artificial life modeling methodology is broadly applicable to the challenge of realistically modeling animals other than fishes—most interestingly, humans. To this end, cognitive modeling, a logic-based artificial intelligence technique that supports knowledge representation, reasoning, and planning, enables the creation of smart graphical characters that know enough about themselves and their world that they may be directed at an abstract level, more like real human actors [9].



(a)



(b)

Figure 3. Biomechanical fish model (a). To emulate a piscine body structure, 23 lumped masses, shown as black dots, are interconnected by 91 viscoelastic elements, shown as lines, each comprising an elastic spring and a viscous damper connected in parallel. Twelve of the elements, depicted as orange lines, serve as contractile muscle actuators. The dotted curves represent functional pectoral fins. Through coordinated muscle and fin actions triggered by the motor center of the artificial fish's brain, this simple physics-based model synthesizes realistic piscine locomotion in virtual fluid. Hydrodynamic locomotion (b). With the tail swinging to the left, the thrust on any point on the body acts opposite to the surface normal at that point. The forward thrust component propels the fish through the simulated water.

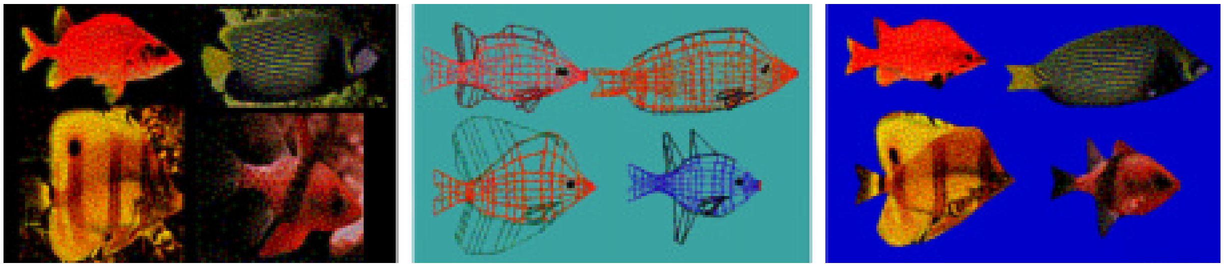


Figure 4. From digitized images of fishes (a) to spline surface body models (b) to three-dimensional, textured fish display models (c).

Acknowledgements

I thank my former students Radek Grzeszczuk, Tamer Rabie, and especially Xiaoyuan Tu, a scientist with extraordinary artistic talent who developed the artificial fishes model, for their outstanding contributions to the work reviewed herein.

References

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CHAR DAVIES AND OSMOSE

By Karl O'Donoghue

The title of this article refers to the immersive virtual reality artwork Osmose, created by Canadian artist Char Davies and her team at Softimage.
Osmosis: Any process by which something is acquired by absorption.
The French translation for the word Osmosis is Osmose. Osmose is the title of the Virtual Reality art work that is the subject of this article.

In the seventeenth century Rene Descartes posited a strict separation between the realm of human consciousness and the natural world. This way of thinking has been widely accepted in the western world, and has helped shape our cultural values. Descartes devised a co-ordinate system, a grid created by the x, y, and z axes. This grid is the foundation for most of today's computer graphics. It produces a cold linear environment, quite the opposite to the world of 'Osmose'.

In Simon Penny's essay, 'Virtual Reality as the Completion of the Enlightenment Project', he attempts to place VR within, and as a product of, the philosophical project of the Enlightenment. Central to this critique he uses the proposition that while VR is technically advanced it is philosophically retrogressive. VR strives for realism in the same way as painters in the early Enlightenment Period, it does not challenge the contemporary Western cultural view. VR reasserts a mind/body split that is essentially "patriarchal and a paradigm of viewing that is phallic, colonizing, and panoptic" (Penny, 1994, p.237)

Recently there has been some criticism of the computer-graphic establishment for its endorsement of a 'gendered' Cartesian space. Computer-graphic production as seen in commercial cinema, video games, theme-park rides and military simulations, is allegedly dominated by a Western male psyche and worldview (Penny, 1994, p.231).

Osmose involves a shift away from VR's usual Cartesian space. It is composed of several different elements, a tree standing in the middle of a clearing, a forest, water on a lower level, the computer code in another lower level and the text (poetry, philosophical texts, etc.) on the upper level. All those elements are not separated in different rooms as usual in VR but belong to the same global structure that you travel through.

Char Davies, Forest Grid

The lowest level within the world of Osmose is the code world. Recognising that Osmose is essentially software, Davies literally placed its programming at the bottom of the virtual universe. According to Davies, these two worlds act as symbols of concrete reality bracketing the world within. They remind the immersant and the viewers that Osmose is a highly crafted construction, a product of both great technological sophistication and intensive conceptualization (Davies, 1995).

The main driving force behind the creation of Osmose was "a desire to heal the Cartesian split between mind and body, subject and object," which according to Davies "has shaped our cultural values."(Davies, 1995, p.1) The work was inspired by a profound deep-sea diving experience in the Bahamas, where Davies got an unforgettable taste of virtual space. Through Osmose, Davies is trying to give the immersant the kind of profound experience she had underwater, an embodied experience of space, one that begins to dissolve the habitual boundaries we maintain between inside and out, between self and world.

Davies in her essay 'Being in Immersive Virtual Space', writes about the spaces that we, as humans, have access to throughout our lives, most people being limited to life as experienced on the surface of the earth. (Davies, 1995, p. 4) This is reflected in the design of conventional VR, as most designers rely on everyday experiences of terrestrial space to define the appearance of their virtual worlds. These worlds end up being filled with hard-edged objects, horizontal floors and walls. The interface methods are also based on things we experience every day, such as walking or driving. These approaches to 'immersive' virtual space limit its potential, and uphold the conventions of a western world view. Osmose is a different kind of space. Ambiguity and transparency are the dominant aesthetic. Osmose does not try to 'Re-Present' a world that already exists in another place; it is a space that only exists within the programming of the computer.

Conventional VR projects reduce the human subject to an isolated and disembodied being manoeuvring in empty space. Cyberspace is the epitome of Cartesian desire, for it enables us to create worlds where we have total control. The long term effect of this, according to Davies, may be to seduce us away from our bodies and ultimately nature. In conventional VR the body is a void. VR arms the eye, it gives the eye a hand of its own, propelled by the gaze itself. The entire body is propelled by scopic desire. We are taught to regard our bodies as an instrument, as apparel, our culture customizes its bodies like it customizes its cars. The body is a representation only, an external appearance, and may be adjusted to suit the taste of the owner. The absolute malleability of the virtual body is different from this only in degree.

VR replaces the body with two partial bodies, the corporeal body, and an incomplete electronic 'body image'. On a bodily level, the conventional VR experience is of dislocation and disassociation. This is precisely what Char Davies is challenging with Osmose. In Osmose there is no reference to the body, there is no representation of the body.

This leads one to look within one's self, for one's own body image. The 'meat' body, when one is experiencing conventional VR, becomes only a machine to press the appropriate buttons or to re-aim the viewpoint, driven by a desiring, controlling mind. The body does not feel, it does not register the virtual world. Only the eyes, privileged as the most accurate of the senses since the Renaissance, register the virtual world.

Michael Heim, when writing about virtual reality, referred to a "leaving the body at the door of the virtual world," but what body is being left at that door? Karen A Franck suggests that it is the 'fleshed' body. The body that needs to eat and sleep, the one that is frail, can become diseased, and will die. She believes that this desire to transcend the flesh body is a masculinist dream (Franck, 1995, p. 22). Davies challenges this masculinist dream by not leaving the body outside, but by bringing the body 'in' to that virtual world, and making it a part of the piece itself, creating a "natural" interaction between the participant and the virtual world. It is the user's body that controls his or her journey through Osmose. In most virtual environments, motion is controlled by a joystick or other manual device that gives the user a kind of godlike control. The work avoids the "masculinist" preoccupation with tropes of penetrating or mastering space reducing our chaotic experience of reality to a more manageable over-simplified model i.e. mastering the world on our terms rather that experiencing it as it is. VR is a safe environment to explore the mind-body experience liberating us from the everyday impulse to prioritise the mental over the physical.

Osmose has a unique interface that was developed specifically for the piece. It reflects the "physical properties of the interactions, the functions to be performed, and the balance of power and control" (Gigliotti, 1995, p. 293). The interactive aesthetic or user interface of Osmose was designed to be body-centred, based on the intuitive, instinctual processes of breathing and balance. The methods of navigation, which were largely inspired by scuba diving, are based on physiological movements. You bend forward, backward, left and right for the horizontal axis and you exhale and inhale for the vertical one. This method of navigation is intended to re-affirm the role of the living physical body in immersive virtual space as subjective experiential ground. "As in meditation, the practice of following one's breath and being centred in balance opens up a profound way of relating to the world." (Davies, 1995, p. 3)

Osmose offers a new, more physical approach to the relationship between the perceiving body and the spaces of information. The interface does not bracket out the bodily processes from the means of accessing information, as does most current interface technologies such as the World Wide Web, where pointing and clinching phallic tools is the only means for interactivity. In Osmose, sense of balance and breathing constitute an interactive surface that, while moving the body in the immersive space, simultaneously alter the physiological condition and state of the body. Deep breath does not only move the 'immersant' in relation to the stereoscopic 3D space but it also brings more oxygen to the body and affects its physical and chemical balance. In the immersive environment of Osmose the border between the interface as a symbolised surface and the surface of the physiological body begins to blur.

Warwick Fox in his essay "Deep Ecology: A New Philosophy of our Time?"(1984), gives a brief but concise overview of the differences between shallow and deep ecology. In shallow ecology figure/ground boundaries are sharply drawn such that humans are perceived as the important figures against a ground that only assumes significance in so far as its use value for humans. This figure ground boundary could be used as a metaphor when talking about Osmose, for in Osmose there is no defined ground and there are no defined boundaries. This purposeful leaving out of a ground serves simply to place the immersent in an environment, rather than dominant over it.

It has been argued that it is misguided sentimentality to suppose that we can simply transplant the values and beliefs from other cultures to our own (Grey, 1986). Osmose does not simply transplant philosophical ideas from one culture to another, it brings those ideas to us in a new medium, through a profound experience visually.

Osmose ignores the fact that the computer technology that it uses to heal the human/nature split is the same technology that that trains fighter pilots to blow it up. Perhaps Davies is simply showing that this technology can be used in less harmful ways than military training. It is a point that Davies has not addressed in any of her writings about Osmose.

It seems that the goal of conventional VR is reached when we cannot distinguish between the computer image and the real thing. According to some, the only thing that VR has achieved is the reduction of space to numbers. VR reflects a longing to transcend the limitations of our physical surroundings, Davies believes that the long term effect of this may be to seduce us away from our bodies and ultimately from nature.

The names of the worlds in Osmose are based on Heidegger's writings. But what would he have thought of VR? Richard Coyne argues that Heidegger would have had little time for a technology that tries to simulate reality by building up an experience from geometrical co-ordinates or barraging the viewer with sense data. (Coyne, 1994, p.68) He argues that Heidegger would have seen the idea of constructing reality (or its resemblance) through data as untenable.

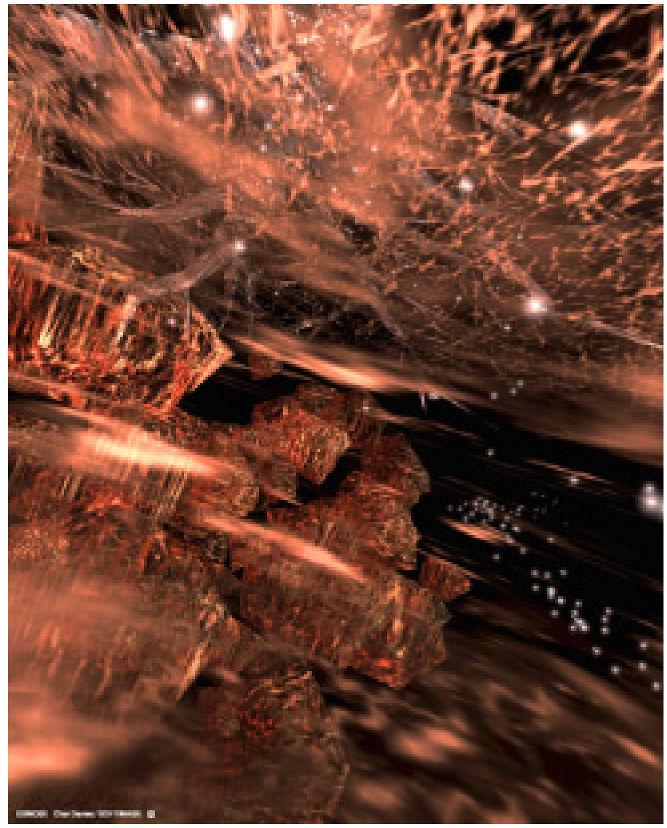
It would be as if to say "nature' is constructed, so let us re-construct it in a computer. This is one of the paradoxes of Osmose, it is not supposed to 'Re-Present' nature, it is supposed to provoke a feeling of nature, and a feeling of being in the world. But according to Heidegger our primordial understanding of being in the world is one of undifferentiated involvement. The idea of VR is the opposite, in that everything in the field of view is presented to the senses.

"VR is a literal enactment of Cartesian ontology", according to Coyne, "cocooning a person as an isolated subject within a field of sensations and claiming that everything is there, presented to the subject" (Coyne 1994 pp.68). Everything that Heidegger suggests about our being indicates that we are not constituted like sense data receptors. Laurie McRobert, on the other hand, argues that Heidegger would have seen Osmose as a bringing forth of truth.

She sees creating a digital work of art that represents nature, when 'real' nature is still all around us, as being a 'curious endeavour'. That perhaps Davies is privy to a premonition of the future, as though she has already resigned herself to, and knows that nature as we know it today will ultimately be lost, and that one day all that we will have left is what computer artists, like herself, will make for us. (McRobert, 1996, p.4)

In Western culture we are already being prepared for the 'condition' of VR, through the spaces that we live in. If we are teaching ourselves now that we can experience the countryside through the window of a car that is travelling at sixty miles per hour, then it is only natural that in the future, we will teach ourselves we can experience nature through VR.

Is there a danger that Davies made the piece too well, by this I mean could people resign themselves to the fact that nature will be lost, and accept VR as the next best thing? It is a possibility, but the feeling of 'being' in a 'natural' environment and the feeling of 'being' in a virtual environment are very different things. I see VR following the male-gendered, mission orientated aesthetic for some time. But I feel Osmose is the first good 'virtual' stab at what VR can be, a meditative, contemplative space, where one can learn to appreciate what we still have in our tactile world.



Char Davies, Rocks

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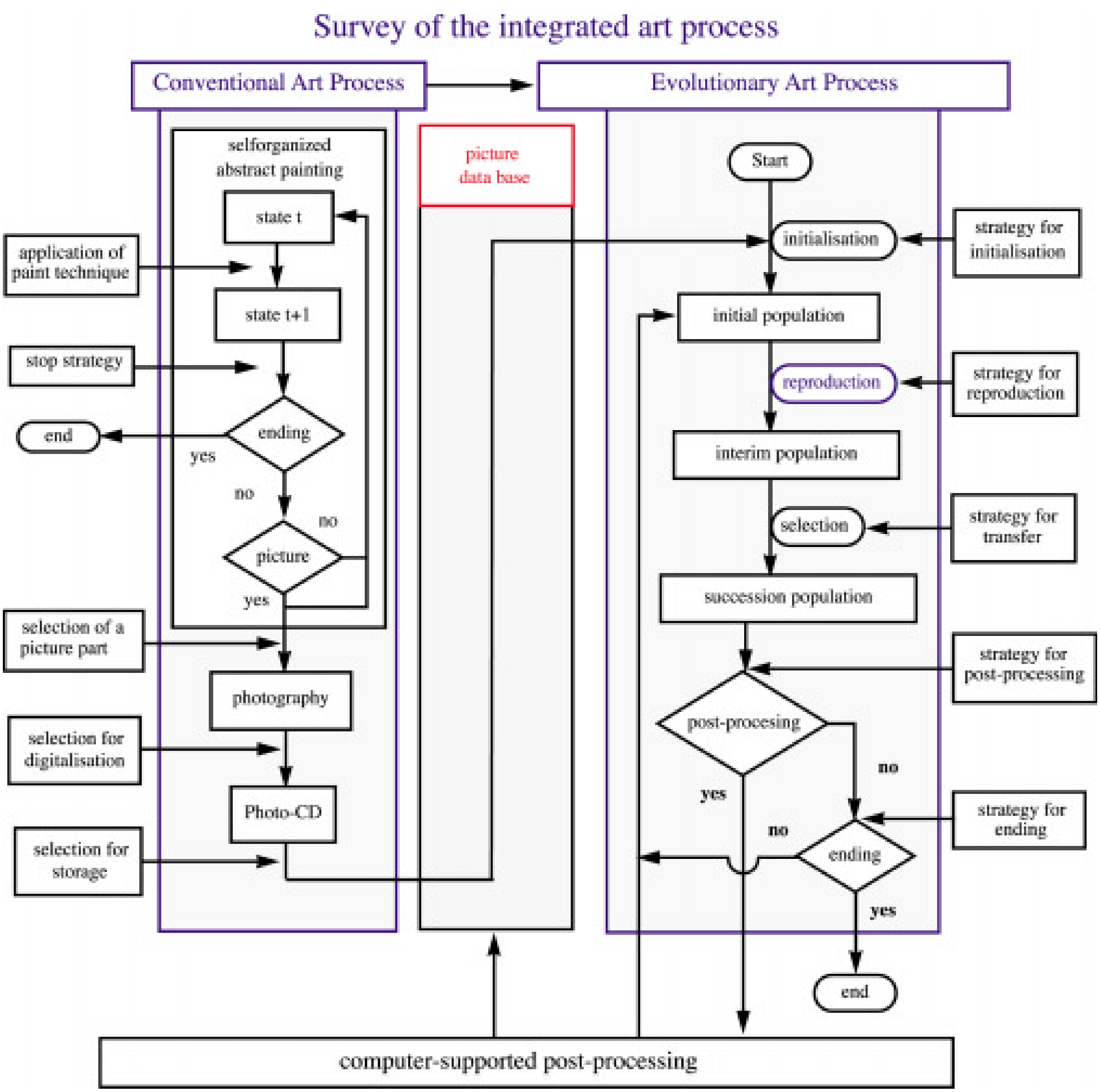
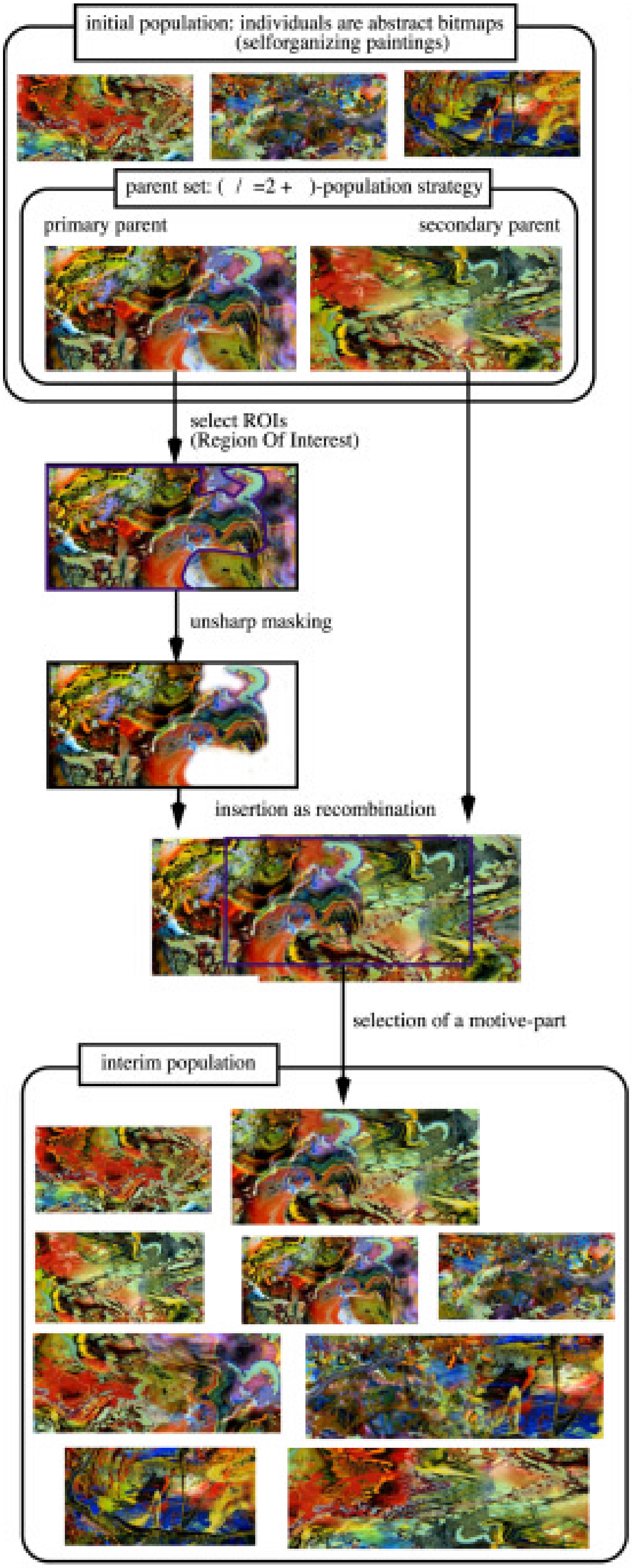
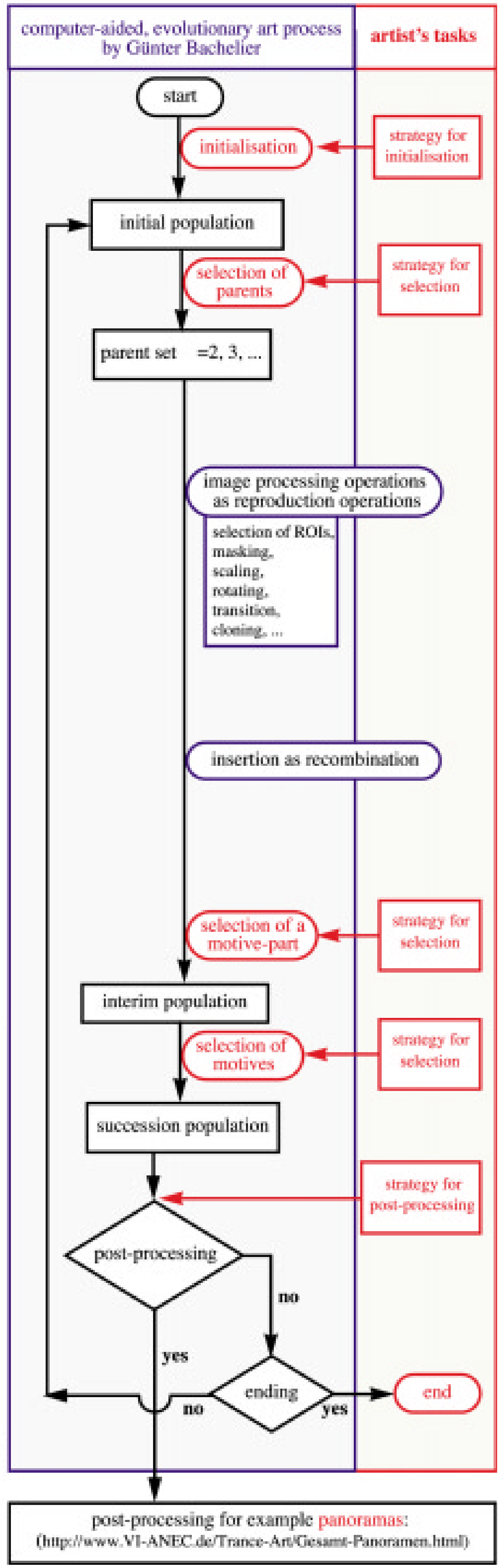
Evolutionary art is defined by the methods to generate art, which derive themselves from processes recognized by biological organisms. These methods are style and material independent. Within these methods a wider range of freedom can be used as in biological systems, because biological systems are limited through their physical implementation constraints.

Evolutionary Art Process

The evolutionary art is defined through the evolutionary art process. Starting with a variety of motives (population of individuals) variations (offspring) of these motives are generated through duplication, mutation and recombination. These offspring individuals are evaluated by the artist (fitness-evaluation). From the parent and the offspring generation some individuals are selected (selection for transfer), which form the next generation. This generation undergoes evolution as well. Motives not selected for the next generation may be stored for later use (living fossils). The central point of an evolutionary process is the continuous development of motives through the evaluation and selection criteria of the artist.

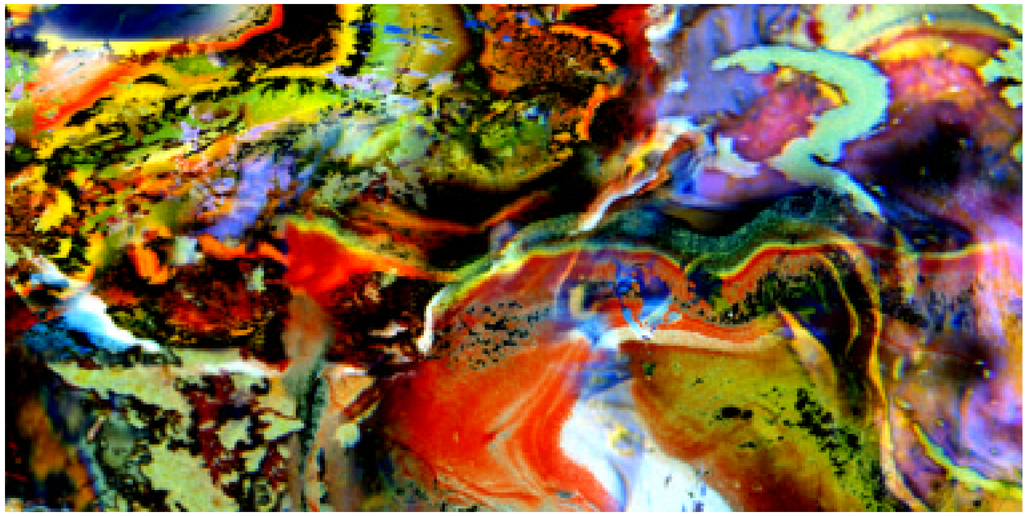






by Dr. Günter Bachelier [Computer-aided Informel - Evolutionary Computerart]
for details: http://www.VI-ANEC.de/Trance-Art/Ausstellung_e.html

Tasks of the Artist
The tasks of the artist within an evolutionary art process includes beside of the evaluation other areas like establishing strategies for initialization, reproduction, transfer, and post-processing.



Guenter Bachelier, 2001-01

Contrast to Creatio ex nihilio
Evolutionary art stands in strong contrast to the usual idea of a unique art work and the myth of a creatio ex nihilio, which means a creation of an art work through an independent creative act by the artist. Those myths which are preserved from a pre-scientific area were falsified within the context of cognition science.

Sequential Integration of two Art Processes
My whole art creating process of can be seen as a sequential integration of a conventional and a computer-supported, data orientated evolutionary art process.

Conventional Art Process
In the framework of the conventional art process, self-organized painting is used, which can be described as physical processes that generate spatial, temporal and colored structures without an external intervention. Interim states are partly photographed. Those photos are selected and evaluated. The best photos are digitized and integrated in a picture data base.

Evolutionary Art Process
In the framework of the evolutionary art process, motives from the picture database are selected and used as a starting population. On this starting population the reproduction operators like mutation and recombination are applied. After the offspring is produced, the artist evaluates the individuals of the offspring. Afterwards a process is started, to choose those individuals from the offspring which form the next population. The resulting images undergo a post-processing phase where inconsistencies are manually resolved.

Mutation
One kind of mutation operator is the color transformation in the RGB-color space. Hence this operation may be interpreted as an application of a global color filter. Other mutation operators are geometric transformations like rotation, scaling and translation as well as the selection of segments of the images with specified attributes like, for instance, the selection of all pixels which are similar to a specified pixel.

Recombination
Recombination uses operators which can be compared to the crossover operations in the theory of genetic algorithms. Segments of one parent image are selected and form with a complementary part of the second image a daughter image. Using geometric operations, masks play the major role. Here single individuals are furnished with masks by the artist, which are selected during the recombination process.

Panoramas
Selected images from the evolutionary art process were used to compose horizontal, cylindrical abstract panorama images. Such panoramas can be moved and presented on web pages with a special java-panorama-viewer.

Symmetry and Symmetry-breaking
In the work since 2002, the concepts of symmetry and symmetry-breaking play a major role. In the evolutionary art process images were included that have special symmetry attributes. Those images were generated with the symmetry-groups of the plane with the help of selected parts of other, non-symmetric abstract images.

Membership Form

YLEM Yearly Membership Includes:
Membership Directory: An annual publication which you are listed with approximately 250 other artists of new art forms.
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__New or __Continuing member

Please describe your work and/or interests in 30 words or less as you would like it to appear in the directory (art, art-science or technology-related interests, services, etc.). Use extra paper if necessary.

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YLEM

n. pronounced eylum, 1. a Greek word for the exploding mass from which the universe emerged.

An international organization of artists, scientists, authors, curators, educators, and art enthusiasts who explore the Intersection of the arts and sciences. Science and technology are driving forces in the contemporary culture. YLEM members strive to bring the humanizing and unifying forces of art to this arena. YLEM members work in new art media such as Computers, Kinetic Sculpture, Interactive Multimedia, Holograms, Robotics, 3-D Media, Film, and Video.

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